



9/26/00

A

PATENT APPLICATION
SHERMAN & SHERMAN REF. NO.: CEL1.0011



NEW APPLICATION TRANSMITTAL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): PHILIP JEFFREY ANTHONY, ENRICO CECCONI

WARNING:

37 CFR § 1.41 (a)(1) points out:

"(a) A Patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53 (d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53 (b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): COMPOUND LOUDSPEAKER DRIVE UNIT HAVING A MAGNET SYSTEM

1. Type of Application

This new application is for a(n)

(check one applicable item below)

☒ Original (nonprovisional)

☐ Design

☐ Plant

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WARNING: Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

WARNING: *Do not use this transmittal for the filing of a provisional application.*

NOTE: If one of the following 3 items apply then complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED** and a **NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION**.

- ☐ Divisional
- ☐ Continuation
- ☐ Continuation-in-part (C-I-P)

2. Benefit of Prior U.S. Application(s)

NOTE: A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. 112. Each prior application must also be:

- (i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or
 - (ii) Complete as set forth in § 1.51(b); or
 - (iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or
 - (iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).
- 37 CFR § 1.78(a)(1).

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED**.

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WARNING:

If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. 120, 121 or 365(c). (35 U.S.C. 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. 119, 365(a) or 365(b)). For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20, 195, at 20,205.

WARNING:

When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 CFR § 1.78(a)(3).

- [] The new application being transmitted claims the benefit of prior U.S. application(s).
Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE
BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

- A. Required For Filing Date Under 37 § CFR 1.53(b) (Regular) or 37 § CFR 1.153
(Design) Application

Pages of Specification	<u>13</u>
Pages of Claims	<u>4</u>
Sheets of Drawing	<u>6</u>

WARNING:

DO NOT submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments or proposed then-new 37 CFR 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).

NOTE: "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone

number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page ..."37 CFR 1.84 (c)).

(complete the following, if applicable)

- ☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 CFR 1.84(b).
☒ formal
☐ informal

B. Other Papers Enclosed _____

Pages of declaration and power of attorney 2

Pages of abstract 1

Assignment and Cover Sheet 4

Other _____

4. Additional papers enclosed

- ☐ Amendment to claims
- ☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)
- ☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)
- ☐ Preliminary Amendment
- ☒ Information Disclosure Statement (37 CFR 1.98)
- ☒ Form PTO-1449 (PTO/SB/08A and 08B)
- ☒ Citations

- ☐ Declaration of Biological Deposit
 - ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
 - ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
 - ☐ Special Comments
 - ☐ Other _____
-

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 CFR §§ 1.63(d) (1)-(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 CFR § 1.63(a)(1)-(4).

☒ Enclosed,

executed by *(check all applicable boxes)*

☒ inventor(s).

☐ legal representative of inventor(s). 37 CFR 1.42 or 1.43

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☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ this is the petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is also attached.

See item 13 below for fee.

☐ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing **ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.**

☐ Application is made by a person authorized under 37 CFR 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 CFR 1.16(e) can be filed subsequently).

☐ Showing that the filing is authorized.

(not required unless called into question. 37 CFR 1.41(d)).

6. Inventorship Statement

WARNING:

If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

☒ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

☐ is submitted.

☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 CFR 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 CFR 1.52(d).

☒ English

☐ Non-English

☐ The attached translation includes a statement translation and is accurate. 37 CFR 1.52(d).

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8. Assignment

☒ An assignment of the invention to KEF AUDIO (UK) LIMITED

☒ is attached. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM TO 1595 is also attached.

☐ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters - one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING:

A newly executed "CERTIFICATE UNDER 37 CFR 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

9. Certified Copy

Certified copy(ies) of application(s):

Country UNITED KINGDOM Appln. No. 0017072.0 Filed: JULY 11, 2000

Country	Appln.	No.	Filed
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*

Country	Appln.	No.	Filed
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*

from which priority is claimed

☐ is/(are) attached

☒ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 CFR 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 CFR 1.16)

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A.

☒ Regular Application

CLAIMS AS FILED

	Number Filed	Number Extra	Rate	Basic Fee 37 CFR 1.16(a)
				\$ <u>690.00</u>
Total Claims (37 CFR 1.16(c))	20	-20 = 0	X \$ 18.00	\$ <u>0.00</u>
Independent Claims (37 CFR 1.16(b))	3	-3 = 0	X \$ 78.00	\$ <u>0.00</u>
Multiple dependent claim(s), if any (37 CFR 1.16(d))		+	\$260.00	\$ <u>0.00</u>

☐ Amendment canceling extra claims enclosed.

☐ Amendment deleting multiple dependencies enclosed.

☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims canceled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 CFR 1.16(d).

Filing Fee Calculation \$ 690.00

B.

☐ Design Application
(\$430.00—37 CFR 1.16(f))

Filing Fee Calculation \$ _____

C.

☐ Plant Application
(\$480.00—37 CFR 1.16(g))

Filing Fee Calculation \$ _____

11. Small Entity Statement(s)

- ☐ Statement(s) that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is (are) attached.

WARNING:

"Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53 (d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 CFR §1.28(a)(2).

(complete the following, if applicable)

- ☐ Status as a small entity was claimed in prior application
_____/_____, filed on _____, from which benefit is
being claimed for this application under:

35 U.S.C. ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of A, B or C above)

\$ _____

NOTE: Any excess of the full fee paid will be refunded if small entity status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 CFR 1.28(a).

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12. Request for International-Type Search (37 CFR 1.104(d))

(complete, if applicable)

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made At This Time

- ☐ Not Enclosed.

- ☐ No filing fee is to be paid at this time.

(This and the surcharge required by 37 CFR 1.16(e) can be paid subsequently.)

- ☒ Enclosed

- | | |
|--|------------------|
| <input checked="" type="checkbox"/> Filing fee | \$ <u>690.00</u> |
| <input checked="" type="checkbox"/> Recording assignment
(\$40.00; 37 CFR 1.21(h))
(See attached COVER SHEET FOR ASSIGNMENT
ACCOMPANYING NEW APPLICATION) | \$ <u>40.00</u> |
| <input type="checkbox"/> Petition fee for filing by other than all the
inventors or person on behalf of the inventor
where inventor refused to sign or cannot be
reached. (\$130.00; 37 CFR 1.47 and 1.17(i)) | \$ _____ |
| <input type="checkbox"/> For processing an application with a
specification in a non-English language.
(\$130.00; 37 CFR 1.52(d) and 1.17(k)) | \$ _____ |
| <input type="checkbox"/> Processing and retention fee
(\$130.00; 37 CFR 1.53(d) and 1.21(l)) | \$ _____ |
| <input type="checkbox"/> Fee for international-type search report
(\$40.00; 37 CFR 1.21(e)) | \$ _____ |

NOTE: 37 CFR 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 CFR 1.53(f) and this, as well as the changes to 37 CFR 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid within 1 year from notification under § 53(f).

Total fees enclosed \$ 730.00

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14. Method of Payment of Fees

- ☒ Check in the amount of \$ 730.00
☐ Charge Account No. 19-1995 in the amount of \$ _____. A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 CFR 1.22(b).

15. Authorization to Charge Additional Fees

WARNING:

If no fees are to be paid on filing, the following items should not be completed.

WARNING:

Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.

- ☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 19-1995.

- ☐ 37 CFR 1.16(a), (f) or (g) (filing fees)
☐ 37 CFR 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims canceled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 CFR 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

- ☐ 37 CFR 1.16(e), (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

- ☒ 37 CFR §1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a)).

- ☒ 37 CFR 1.17(a)(1)-(5) (application processing fees)

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NOTE: "... A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 CFR § 1.136(a)(3).

[] 37 CFR 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 CFR 1.311 (b).

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 CFR 1.311(b).

NOTE: 37 CFR 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application...prior to paying, or at the time of paying...the issue fee..." From the wording of 37 CFR 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity"; and (b) no notification is required if the change is to another small entity.

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16. Instructions As To Overpayment

NOTE: "... Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 CFR § 1.26(a).

☒ Credit Account No. 19-1995

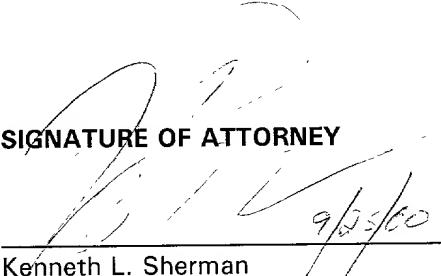
☐ Refund

SIGNATURE OF PRACTITIONER

Reg. No. 33,783

Tel. No. (310) 789-3200

SIGNATURE OF ATTORNEY


Kenneth L. Sherman
Registration No. 33,783
SHERMAN & SHERMAN, APC
2029 Century Park East
Seventeenth Floor
Los Angeles, California 90067

CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date September 25, 2000 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EE5062440915 addressed to the: Assistant Commissioner for Patents, Washington, D. C. 20231.

EVELYN MENJIVAR

(Type or print name of person mailing paper)


(Signature of person mailing paper)

WARNING:

Certificate of mailing (first class) or facsimile transmission procedures of 37 CFR 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

WARNING:

Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 CFR 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight than can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

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☐ **Incorporation by reference of added pages**

(Check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED).

- ☐ Plus Added Pages for New Application Transmittal Where Benefit Of Prior U.S. Application(s) Claimed

Number of pages added _____

-
- ☐ Plus Added Pages for Papers Referred To In Item 4 Above

Number of pages added _____

-
- ☐ Plus Added Pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

- ☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

- ☒ Statement Where No Further Pages Added

(If no further pages form a part of this transmittal, then end this transmittal with this page and check the following item)

- ☒ This transmittal ends with this page.

UNITED STATES PATENT APPLICATION

FOR

COMPOUND LOUDSPEAKER DRIVE UNIT HAVING A MAGNET SYSTEM

Inventors:

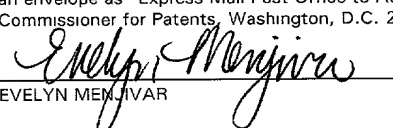
Philip Jeffrey Anthony
Enrico Cecconi

Prepared by:

Kenneth L. Sherman
Sherman & Sherman
2029 Century Park East
17th Floor
Los Angeles, CA 90067
Telephone (310) 789-3200
Facsimile (310) 789-3210

CERTIFICATE OF MAILING BY "EXPRESS MAIL"

I hereby certify that this paper of fee is being deposited with the United States Postal Service on this date: September 25, 2000, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EE60624408-9 US addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231


EVELYN MENJIVAR

COMPOUND LOUDSPEAKER HAVING A MAGNET SYSTEM

FIELD OF THE INVENTION:

5 This invention relates to transducers and magnets contained therein, and particularly to low and high frequency transducers, such as compound loudspeakers, having a combined magnet system.

BACKGROUND OF THE INVENTION:

10 Conventional speakers utilize standard ferrous magnets in conjunction with a voice coil to control the speaker cone, dome, or other diaphragm. However, such magnets are relatively large and heavy and produce stray magnetic fields which require bulky shielding to contain or increased distance therebetween and unnecessarily increase both the size and
15 weight of the speaker.

 It is desirable in high fidelity speakers to place the high frequency diaphragm as close to the mid to low frequency diaphragm as possible so that the sound appears to come from a single source. To achieve this result, it is known that a sub-compact assembly is required. It
20 has been found that such a sub-compact design can be achieved by utilizing high energy magnets, such as magnets formed of neodymium-iron-boron in place of the standard ferrous magnets.

 However, even with the use of the neodymium-iron-boron magnets, assemblies of the
25 drive units are still bulky and complicated requiring numerous parts and numerous steps to

assemble. For example, US Patent No. 5,548,657 to Fincham discloses a compound loud speaker drive unit that has a first transducer for producing sounds in the low frequency range and a second transducer for producing sounds in the high frequency range. However, the large magnetic structure and the complicated assembly thereof adds to the overall depth and weight of the drive units in an undesired fashion.

Therefore, there remains a long standing and continuing need for an advance in the art of compound loud speakers that is simpler in both design and use, is more economical, compact, and efficient in its construction and use, and can quickly be assembled while eliminating the need for larger magnets and drive units.

SUMMARY OF THE INVENTION:

Accordingly, it is a general object of the present invention to overcome the disadvantages of the prior art.

In particular, it is an object of the present invention to provide a compound loud speaker with fewer parts.

It is another object of the present invention to provide a compound loud speaker wherein the transducers are reduced in size.

It is another object of the present invention to provide a compound loud speaker wherein the assembly is reduced in weight.

It is another object of the present invention to provide a compound loud speaker wherein the magnets and their housing is relatively compact.

It is yet another object of the present invention to provide a compound loud speaker
5 wherein the transducers are reduced in weight.

It is yet another object of the present invention to provide a compound loud speaker that is easily and quickly assembled and disassembled.

It is yet another object of the present invention to provide a compound loud speaker wherein the magnet structures can be magnetized in unison after assembly thereof.

It is yet another object of the present invention to provide a compound loud speaker wherein the high frequency voice coil and the low frequency voice coil are in close proximity
15 to one another.

In keeping with the principles of the present invention, a unique high frequency loudspeaker is presented which overcomes the shortfall of the prior art. The loudspeaker has a circular first seat that has a peripheral annular wall that extends perpendicularly therefrom.

20 First seat is a magnet pot and is preferably constructed of steel. A first magnet that is preferably disk shaped is received within the wall of first seat to form a uniform channel between the first magnet and the wall. First magnet is preferably the same height as the wall to form an even plane. At least an aperture extends through first seat at a position between first magnet and the wall wherein the channel is defined. First magnet is attached to the floor
25 of the first seat by any adhesive means that is known in the art such as, but not limited to,

structural adhesives.

A second seat, preferably being circular in nature, is positioned upon first magnet and wall of first seat without occluding the uniform channel. Second seat has an annular protrusion that extends in an opposing direction from said first seat and encircles a second disk shaped magnet therein. An annular opening is defined between the protrusion and the second magnet.

The second seat has an annular flange that extends past the annular protrusion and rests upon the annular wall of the first seat. The flange is provided with a means for binding the second seat to the annular wall of the first seat. At least a void is defined through the flange and the void is in substantial axial alignment with the aperture of the first seat to allow electrical conductors to pass therethrough.

The second magnet has a disk shaped plate thereon that is preferably of the same radius as the magnet. The plate has a dome shaped diaphragm thereon that is moveably suspended thereon. The dome shaped diaphragm has a voice coil thereon that extends into the annular gap. As a current is applied to the voice coil, the voice coil is forced to move within the gap due to the magnetic flux created by the magnets. Accordingly, the dome moves back and forth and thereby generates audio output.

An annular chassis is positioned over the flange of the second seat and the chassis moveably maintains a generally conical diaphragm thereon. A second voice coil is maintained on the conical diaphragm and extends into and within the opening defined between the annular wall and the first disk shaped magnet. As current is applied to the

second voice coil, the voice coil is forced to move within the annular opening due to the magnetic flux created by the magnets. Accordingly, the conical diaphragm moves back and forth and thereby generates audio output.

5 As a result, the disk shaped first and second magnets reduce the number of parts necessary to assemble the compound loud speaker. In addition, the compact nature of the magnets allows the first and second voice coils to be proximal in distance to allow coincidence of the sound source thereby increasing clarity. In addition, the present arrangements of the two magnets allows the option of magnetizing the two magnets
10 simultaneously after they have been assembled.

Such stated objects and advantages of the invention are only examples and should not be construed as limiting this invention. These and other objects, features, aspects, and advantages of the invention herein will become more apparent from the following detailed
15 description of the embodiments of the invention when taken in conjunction with the accompanying drawings and the claims that follow.

BRIEF DESCRIPTION OF THE DRAWINGS:

20 It is to be understood that the drawings are to be used for the purposes of illustration only and not as a definition of the limits of the invention.

In the drawings, wherein similar reference characters denote similar elements throughout the several views:

Figure 1 is a top plan view of the high frequency domed diaphragm as connected to the driver portion of the invention.

Figure 2 is a cross-sectional view of a high frequency domed diaphragm and the driver portion taken along line 2—2 of figure 1.

Figure 3 is a cross sectional view of the loudspeaker also illustrating the chassis and the low frequency diaphragm.

Figure 4 is a top plan view of a compound loud speaker.

Figure 5 is a cross sectional view of an alternate preferred embodiment of the loudspeaker also illustrating the chassis and the low frequency diaphragm.

Figure 6 is a cross sectional view of the driver portion and the high frequency dome of an alternate preferred embodiment.

DETAILED DESCRIPTION OF THE INVENTION:

Referring to Figures 1 through 6, therein are illustrated several views of preferred embodiments of a transducer 10 in the form of a compound loudspeaker. Transducer 10 has a first seat 12 having a top surface 14 and a bottom surface 16. A wall 18 extends perpendicularly from top surface 14 at an outer portion of first seat 12. First seat 12 is preferably circular and wall 18 is annular. First seat 12 may be a magnet pot and is preferably constructed of steel, but is not limited thereto.

A first magnet 24, that is preferably disk shaped, is received within first seat 12 on top surface 14 thereof, such that a substantially uniform channel 26 is maintained between first magnet 24 and wall 18. First magnet 24 may be attached to top surface 14 of seat 12 by any attaching means that is known in the art such as, but not limited to, structural adhesives. In addition, first magnet 24 is adapted to be substantially even in height with a top end 22 of wall 18. At least an aperture 28 extends from top surface 14 and out through bottom surface 16 of first seat 12. Aperture 28 is preferably positioned between first magnet 24 and wall 18 and is generally below channel 26.

A second seat 30 having a top side 32 and a bottom side 34 is positioned upon first magnet 24 such that bottom side 34 contacts magnet 24 at an end opposing said first seat 12. Second seat 30 may be attached to magnet 24 by any attaching means that is known in the art such as, but not limited to, structural adhesives. Second seat 30 may be a magnet pot and is preferably constructed of steel, but is not limited thereto and may be made of any suitable material that is known in the art. Second seat 30 is preferably circular in nature and has a protrusion 36 extending perpendicularly from top side 32 and forming an annular wall. At an upper end 38 of protrusion 36, an annular lip 40 extends perpendicularly inward from protrusion 36 and is substantially parallel to top side 32.

An annular flange 42 extends outwardly from second seat 30 at an even plane with bottom side 34 and rests on top end 22 of wall 18. Flange 42 defines at least a cavity 44 therein, and preferably four equidistantly spaced cavities 44 on said flange 42, such that the cavity 44 rests on top end 22. Cavity 44 can accommodate a binding means such as, but not limited to, a threaded element so that second seat 30 may be removably attached to first seat 12. At least an opening 46 is preferably annular and is also defined by flange 42, and opening

46 is more medially positioned in relation to cavity 44. At least a void 48 is also defined through flange 42 and void 48 is more medially positioned than opening 46. In addition, void 48 is in substantial axial alignment with aperture 28. In a preferred embodiment, two voids 48 are located opposing each other on a central line that equally bisects second seat 30.

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A second magnet 50 having a substantially disc shape is placed on top of top side 32 of second seat 30 such that it is equidistantly spaced from protrusion 36 whereby an annular groove is created therebetween. A plate 54 is positioned upon said second magnet 50 such that plate 54 is in a congruent plane with lip 40 of protrusion 36. Second magnet 50 may be attached to second seat 30 and plate 54 by any attaching means that is known in the art such as, but not limited to, a structural adhesive. An annular gap 56 is defined between an outer edge 34 of plate 30 and flange 26 of wall 24. In a preferred embodiment, annular gap 56 may be injected with a metallic fluid, preferably a ferrofluid, or with some other substance that has good heat transfer characteristics but does not interfere with movements of components therein.

15

A spacer 58, having an annular shape, is positioned over an outer surface of protrusion 36 of second seat 30. Spacer 58 has a vertical portion 60 that connects to an outer surface of protrusion 36, and a horizontal portion 62 that connects to an upper region of lip 40. Vertical portion 60 is preferably in axial alignment with void 48 and aperture 28 and is adapted to receive an electrical conducting element 64 that passes through void 48 and aperture 28. Horizontal portion 62 is also adapted to accommodate element 64 therethrough. Element 64 is an electrical conductor that is electrically insulated from first seat 12, second seat 30, and channel 26 as it passes therethrough.

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A high frequency domed diaphragm 66 has an annular support 68 at an outer periphery thereof that is of annular corrugated form and support 68 is connected to spacer 58 in a movable fashion. Secured to diaphragm 66 is a cylindrical coil former carrying a high frequency voice coil 70 such that the voice coil extends through the gap 56. Diaphragm 66 may be constructed of a variety of rigid materials, and in a preferred embodiment, diaphragm 66 is constructed from metals such as, but not limited to, titanium or aluminum. Diaphragm 66 may also be constructed from a plurality of alloys containing metals such as, but not limited to, aluminum and boron. In addition, diaphragm 66 may also be made of a soft material such as, but not limited to, sealed cloth, flexible materials such as plastics, or other suitable material that is known in the art. In operation, as current is applied to conducting element 64 and in turn to voice coil 70, voice coil 70 is forced to move in gap 56 due to the magnetic flux created by first magnet 24 and second magnet 50, lip 40, second seat 30, and plate 54. In turn the domed diaphragm 66 is caused to move back and forth axially. As the dome moves forward, it compresses the air in front of it and as the dome moves backward it rarefies the air in front of it, and thus the desired audio output is produced by the numerous compressions and rarefactions.

Now referring specifically to figures 3, 4, 5, and 6 a chassis 72 has a front annular projection 74 and a rear annular member 76 that are interconnected by a plurality of ribs 78. Rear annular member 76 has a medially projecting annular brim 80. Annular brim 80 is connected to flange 42 of second seat 30 in a secure yet removable fashion and is fitted thereon in such a fashion as not to occlude opening 46.

A second diaphragm 82 comprises the mid to low frequency diaphragm and is of generally frusto-conical form. At an outer edge 84, the second diaphragm 82 is connected to

projection 74 via a flexible surround 86. At an inner edge 88, the second diaphragm 82 is connected to a tubular coil former 90 and coil former 90 is adapted to extend into the opening 46 defined by flange 42. Coil former 90 carries the mid to low frequency voice coil thereon such that the coil extends through opening 46.

5

A suspension member 92, that is annular and flexible in nature is secured between annular member 76 of chassis 72 and the coil former 90 in order to ensure that coil former 90 and the voice coil carried thereon are maintained concentric with and within opening 46 and out of physical contact with the surrounding elements during sound producing movements of second diaphragm 82. The length of the coil former 90 may be extended or shortened as desired to control the distance of second diaphragm 82 from domed diaphragm 66.

Connections to the mid to low frequency voice coil are provided by means of flexible leadout conductors 94 extending from the voice coil to external connectors 96.

It will be appreciated that with the high frequency drive unit positioned at or adjacent to the neck of the second diaphragm 82 of the mid to low frequency drive unit, as above described, the apparent sound source or acoustic center of the high frequency drive unit is substantially co-incident with the apparent sound source or acoustic center of the mid to low frequency drive unit.

20

The radiation pattern or directivity of the low frequency drive unit is determined inter alia by the form of the low frequency second diaphragm 82 and an annular wave guide 98 surrounding said domed diaphragm 66. With the high frequency drive unit positioned adjacent to the neck of the mid to low frequency second diaphragm 82, the form of the mid to

low frequency cover imposes its directivity upon the radiation pattern or directivity of the

high frequency unit. Consequently, at frequencies at which both drive units contribute significant sound output both drive units have substantially similar patterns of radiation or directivity. As a result, the relative sound contributions from the two drive units as perceived by a listener are substantially unaffected by the listener being positioned at off axis positions.

5

The mid to low frequency diaphragm is shown to be a cover of conical form having an angle of flare which increases from inner edge 88 to outer edge 84. However, it will be appreciated that the cover may be of conical form having a uniform angle of flare. Also, the mid to low frequency cover may be of circular, elliptical, square, rectangular, or other section as desired.

10

The high frequency diaphragm 66 is shown in the drawing as being of domed form. Such a diaphragm is suitable because its acoustic center may be readily located in close coincidence with that of the mid to low frequency diaphragm, and because, in the frequency range where both units contribute significant sound output, its small size relative to wavelength gives it, by itself, essentially non-directional sound radiation, allowing the effective directivity to be determined by the mid to low frequency diaphragm. It will be appreciated that the high frequency diaphragm 66 may alternatively be of any other form that provides these characteristics.

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It will also be appreciated that the arrangement of the first magnet 24 and second magnet 50 of the present invention reduces the number of parts necessary to assemble the two drive units. In addition, the present arrangement of the two magnets allows the magnetization thereof as an assembly, whereas, in the prior art, each magnet had to be magnetized individually and then assembled. Furthermore, the present magnets may either have similar

25

polarity, thereby allowing magnetization as an assembly, or may have opposite polarities, wherein the magnets are individually magnetized and then assembled.

While the above description contains many specificities, these should not be construed
5 as limitations on the scope of the invention, but rather as an exemplification of one preferred
embodiment thereof. Many other variations are possible without departing from the essential
spirit of this invention. Accordingly, the scope of the invention should be determined not by
the embodiment illustrated, but by the appended claims and their legal equivalents.

CLAIMS

What is claimed is:

1. A high frequency transducer, comprising:

a first diaphragm having a first coil thereon;

a second diaphragm having a second coil thereon formed on a periphery of said first diaphragm;

5 a first seat having a first magnet structure, said first seat defining an annular opening to allow said second coil to be moveably suspended therein; and

a second seat having a second magnet structure, said second seat and said second magnet defining an annular gap to allow said first coil to be moveably suspended therein.

2. The invention of Claim 1, wherein said first and second magnets are substantially disk shaped.

3. The invention of Claim 1, wherein said first and second magnets are substantially flat in structure.

4. The invention of Claim 2, wherein said first magnet and said second magnet can be magnetized after assembly.

5. The invention of Claim 2, wherein said first magnet and said second magnet can be magnetized simultaneously after assembly.

6. The invention of Claim 2, wherein said first magnet and said second magnet have similar polarity.

7. The invention of Claim 2, wherein said first and second magnets are neodymium iron boron magnets.

8. The invention of Claim 2, wherein said second seat is positioned on said first seat to enclose said first magnet therein but does not occlude said annular opening.

9. The invention of Claim 8, wherein a disk shaped plate is placed on said second magnet and does not occlude said annular gap.

10. The invention of Claim 9, wherein a substantially annular wall extends from an outer periphery of said second seat to encompass said second magnet and said plate.

11. The invention of claim 10, wherein a lip extends inwardly to define said gap between said lip and said plate.

12. The invention of Claim 2, wherein said annular gap contains a substance having high heat transfer capability.

13. The invention of Claim 12, wherein said substance is a metallic fluid and is injected into said annular gap.

14. The invention of Claim 13, wherein said metallic fluid is a ferrofluid and is injected into said annular gap.

15. A high frequency loud speaker, comprising:

a first diaphragm having a first coil thereon;

a second diaphragm having a second coil thereon formed on a periphery of said first diaphragm;

5 a first seat having an annular first wall extending therefrom and encircling a first magnet having a flat structure therein, said first wall and said first magnet defining an annular opening therebetween to allow said second coil to be moveably suspended therein; and

10 a second seat having a second annular wall extending therefrom and encircling a second magnet having a flat structure, said second wall and said second magnet defining an annular gap to allow said first coil to be moveably suspended therein.

16. The invention of Claim 15, wherein said first and second magnets have a substantially disk shaped structure.

17. The invention of Claim 16, wherein said second seat is positioned on said first seat to enclose said first magnet therein but does not occlude said annular gap.

18. The invention of Claim 17, wherein said first and second magnets are magnetized after said second seat is positioned over said first seat.

19. The invention of Claim 18, wherein a plate is concentrically placed upon said second magnet, and said plate also accommodates a domed diaphragm thereon on a side opposing said second magnet.

20. A high frequency transducer, comprising:

a first dome shaped diaphragm having a first coil thereon;

a second conical diaphragm having a second coil thereon formed on a periphery of said first diaphragm;

5 a first seat having a first disk shaped magnet, said first seat and said magnet defining an annular opening to allow said second coil to be moveably suspended therein;

at least an aperture being defined through said first seat and being position between said first magnet and said first seat;

10 a second seat having a second magnet structure, said second seat and said second magnet defining an annular gap to allow said first coil to be moveably suspended therein;

said second seat being positioned over said first seat to encompass said first magnet therein without occluding said annular opening;

at least a void being defined through said second seat, said void being in substantial axial alignment with said aperture;

15 at least an electrical conducting element passing through said void and said aperture; and

said first and second magnets being magnetized simultaneously after assembly of said high frequency transducer.

ABSTRACT

A mid and high frequency transducer having a compact magnet system. A first seat has an annular wall that retains a first disk shaped magnet therein and an annular channel is defined therebetween. A second seat rests on top of the first magnet and first seat and is connected thereto but does not occlude the annular opening. The second seat has an annular wall that retains a second disk shaped magnet therein such that a uniform annular gap is defined therebetween. A first voice coil is connected to a first diaphragm and is moveably suspended within annular channel and a second voice coil is connected to a second diaphragm and is moveably suspended within the annular gap. Application of an electric current to the voice coils causes movement of the diaphragms due to the magnetic flux created within the annular channel and gap and thereby produces sound waves.

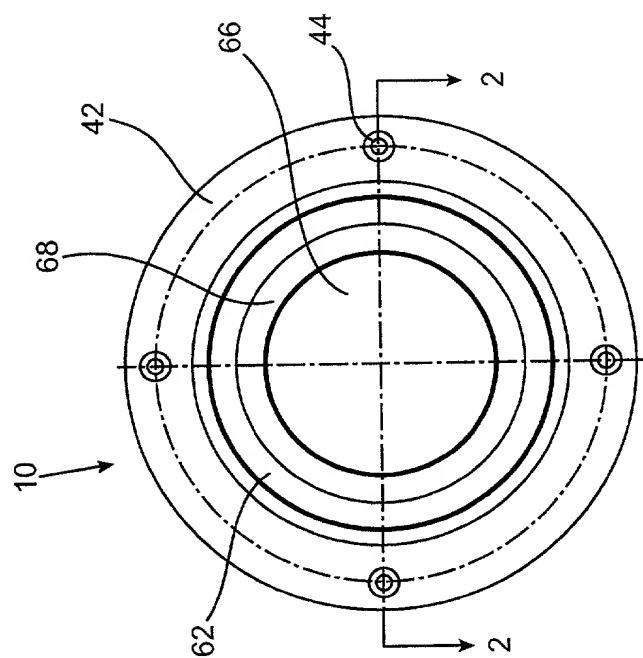


FIG. 1

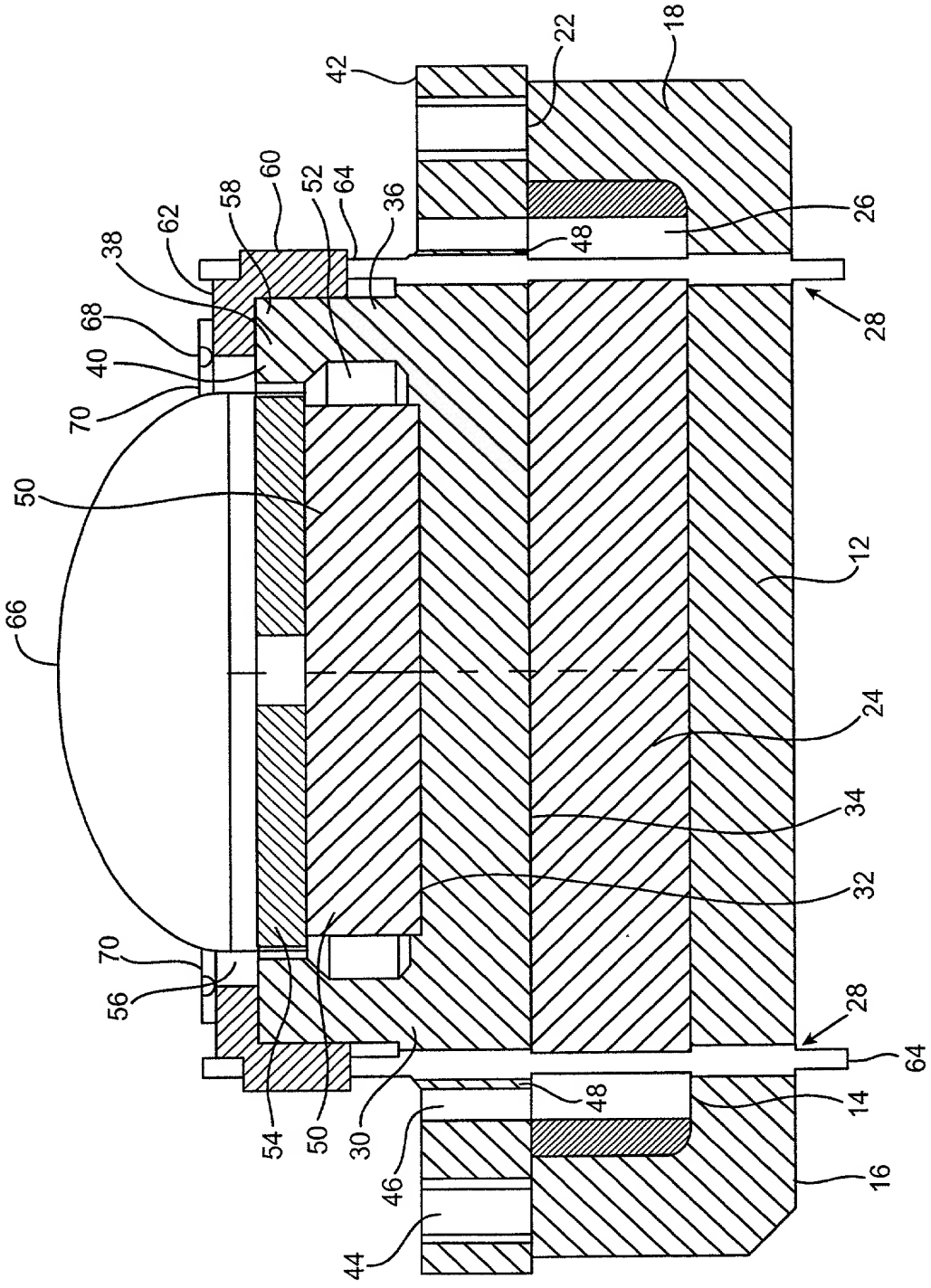


FIG. 2

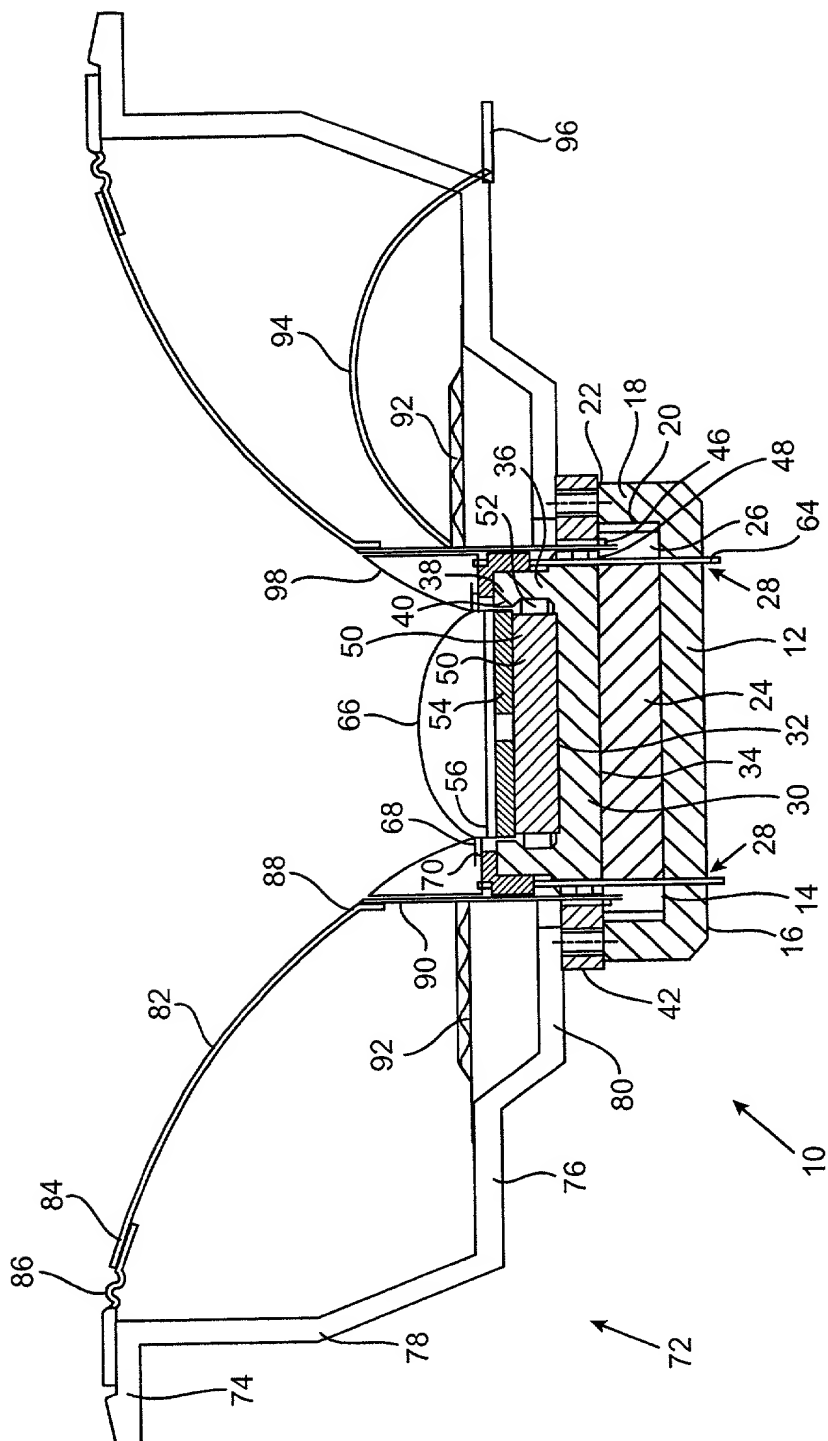


FIG. 3

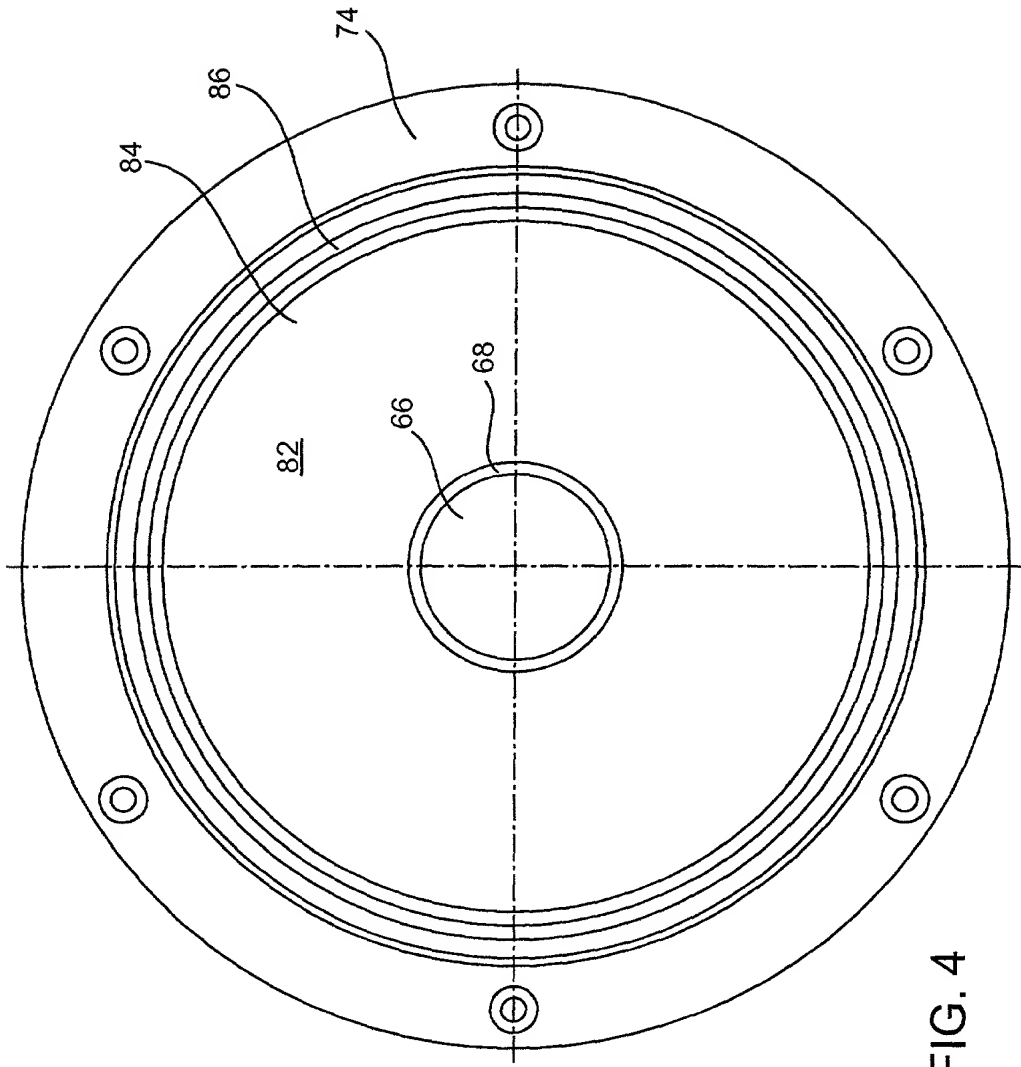


FIG. 4

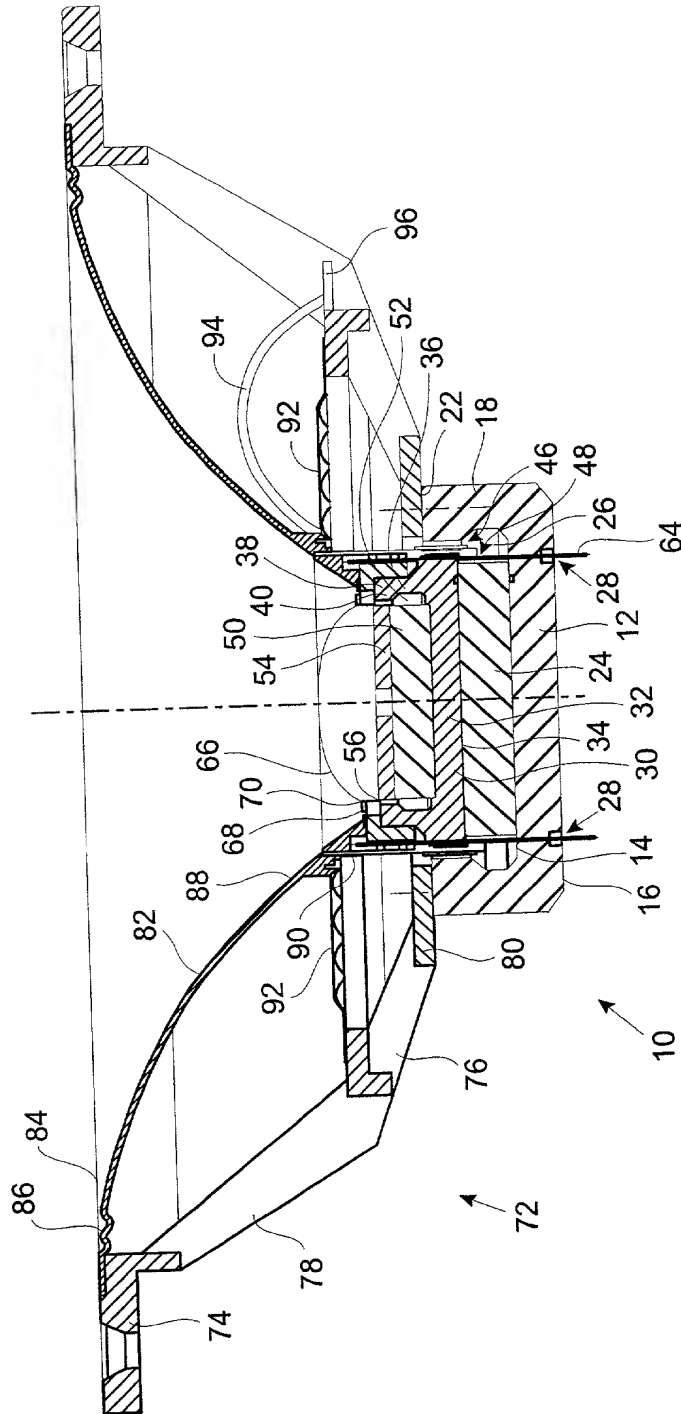


FIG. 5

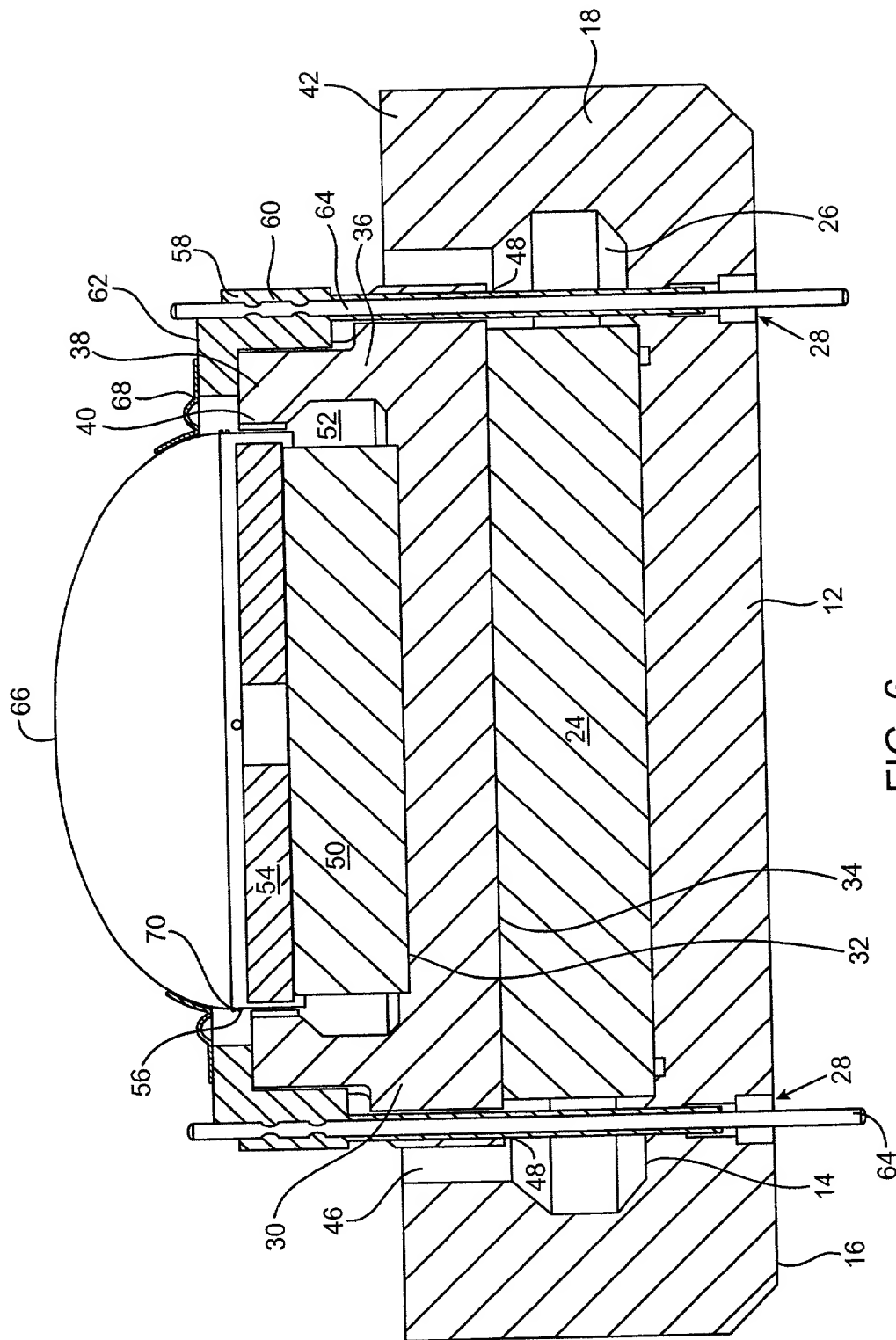


FIG. 6

LAW OFFICES OF
SHERMAN & SHERMAN
A PROFESSIONAL CORPORATION
ONE CENTURY PLAZA
2029 CENTURY PARK EAST
SEVENTEENTH FLOOR

DOCKET NO. CEL1.0011

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PATENT APPLICATION

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**DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION**

As a below named inventor(s) of an invention titled COMPOUND LOUDSPEAKER HAVING A MAGNET SYSTEM, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled COMPOUND LOUDSPEAKER HAVING A MAGNET SYSTEM the specification of which (check one)

 X is attached hereto
_____ was filed on _____ Application Serial No. _____ and was
amended on (or amended through) _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Sec. 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)	Priority Claimed
0017072.0 <u>United Kingdom</u> <u>July 11, 2000</u>	<u> X </u>
Number Country Day/Month/Year Filed	Yes No

I hereby claim the benefit under Title 35, United States Code, Sec. 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Sec. 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Sec. 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

<u>None</u>		
Appln. Serial No.	Filing Date	Status (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I/(We) hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: KENNETH L. SHERMAN, Registration No. 33,783, MILORD KESHISHZADEH, Registration No. 43,333, MICHAEL Z. ZARRABIAN, Registration No. 39,886. Direct all telephone calls to Kenneth L. Sherman at telephone No. (310) 789-3200.

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